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(54) Title of the invention Flexible wiring substrate

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SPECIFICATION

TITLE OF THE INVENTION

Flexible wiring substrate

WHAT IS CLAIMED IS :

Flexible wiring substrate wherein a circuit pattern is formed by etching in base material which is constituted by synthetic fibres coated with an electrically conductive metal and by insulation layers.

DETAILED DESCRIPTION OF THE INVENTION

Field of industrial use

The present invention relates to a flexible wiring substrate which is used for wiring electronic circuits or for mounting electronic parts.

Prior art

Conventionally, a flexible wiring substrate which is used for wiring electronic circuits or for mounting electronic parts is one in which the entirety of base material is formed by a heat-resistant polyimide or polyester, and a copper wiring pattern is formed on this.

Problems intended to be resolved by the invention

However, the polyimide or polyester constituting the base material is expensive, and so there is the problem that there is an increased cost of materials and the cost of fabricating a flexible wiring substrate becomes high,

There is also the drawback that, with a polyimide or polyester used for the entirety of base material, it is difficult to bend a flexible wiring substrate, since, when it is bent, restoring stress acts.

In view of the above points, it is the object of the present invention to provide a flexible wiring substrate with which a good bending characteristic is achieved and which can be fabricated at low cost.

Means for resolving the problems

The present invention is one in which the base material of a flexible wiring substrate is formed by synthetic fibres coated with an electrically conductive metal and by insulation layers, and circuit patterns are formed in electrically conductive metal portions which remain after etching.

Effect

In the invention, base material constituted by synthetic fibres coated with an electrically conductive metal and by insulation layers is low-cost and has a good bending characteristic, and, therefore, if conductive patterns are formed by means of the electrically conductive metal of portions where electrically conductive metal is not removed by etching, a flexible wiring substrate can be produced at low cost and the substrate can be made one which has a good bending characteristic.

Example of implementation

One example of implementation of the flexible wiring substrate of the invention will be described with reference to Figs. 1-5.

1 and 2 in Fig. 1 indicate conductive wiring patterns, and these conductive wiring patterns 1 and 2 are formed by respective bundles of electrically conductive warp yarn 3 and bundles of electrically conductive weft yarn 4. The electrically conductive warp yarn 3 and electrically conductive weft yarn 4 are made electrically conductive by coating an electrically conductive metal such as copper or nickel, etc. on the surface of yarn constituted by a synthetic resin such as a polyester, etc. and thereby forming surface metal layers 3a and 4a. 5 here is an insulating adhesive layer.

6, 7 and 8 indicate insulation layers. These insulation layers 6 7 and 8 consist of insulating warp yarn 9 and weft yarn 10 made of a synthetic resin such, eg, as a polyester, etc. and the insulating adhesive layer 5.

11 indicates an insulating layer formed by a urethane sheet.

In this flexible wiring substrate, since the conductive patterns are disposed in the same manner as the copper foil patterns of conventional flexible wiring substrates, there is also formation of land portions 12 (Fig. 2), and the substrate can be used for electronic part wiring and electronic part mounting.

Next the stages of fabrication of this example will be described with reference to Fig. 3 - Fig. 5.

First, a substrate b in which an insulating layer 11 such as a urethane sheet, etc. is provided on one surface of an electrically conductive layer in which electrically conductive warp yarn 12 and electrically conductive weft yarn 13 are disposed is prepared (Fig. 3). The electrically conductive warp yarn 12 and electrically conductive weft yarn 13 are constituted by yarn on which surface metal layers 12a and 13a are formed by coating an electrically conductive metal, eg, copper or nickel on the surface of synthetic fibre in the form of polyester yarn and thereby forming surface metal layers 12a and 13a. Next, as indicated in Fig. 4, an etching resist ink is coated by screen printing on the portions where it is intended to form conductive patterns. Then, the electrically conductive metal of the portions other than at the portions 14a, 14b and 14c which have been coated with the ink 14 is removed by etching, so forming insulation layers (Fig. 5). Simultaneously with this, electrically conductive layers are formed and conductive patterns are formed. Next, the ink constituting the etching resist for the purpose of formation of the conductive patterns is removed. After that, the flexible wiring substrate of this example is obtained by going through work stages like those for a conventional flexible wiring substrate, such as a stage in which screen printing of solder resist ink is effected in a manner such as to leave only those portions where electrical connections are necessary and a stage of printing of symbol marks, etc.

In this example thus constituted, electronic circuit wiring and electronic part mounting too can be effected in the same way as for a conventional printed wiring substrate.

With this example, since, as described above, conductive patterns constituting circuit patterns are formed by etching in base material which is

constituted by synthetic fibres to which electrically conductive metal is adhered and insulation layers, fabrication can be effected more cheaply than is the case with conventional flexible wiring substrates, and the substrate is useful when employed instead of wires. Further, since the conductive patterns 1 and 2 are formed by conductive layers in which electrically conductive metal is adhered to the surfaces of synthetic fibres, the substrate possesses excellent flexibility such as not seen in the past, and since, in addition, it is excellent in respect of mechanical strength, it is also suitable for parts which are subjected to very frequent bending in use, such as the connections to terminals of the mechanical devices of tape recorders or video tape recorders. Also, since this example can be formed with a specific gravity on a par with that of fibres and is lightweight, it is possible to design for a reduction of the weight of a device in which the flexible wiring substrate is used.

Needless to say, the invention is not limited to the above example of implementation, but it is possible to adopt a variety of other structures without departure from the essence of the invention.

Advantages of the invention

According to the invention, since circuit patterns are formed by etching in base material which is constituted by synthetic fibres to which electrically conductive metal is adhered and insulation layers, there is the advantage that fabrication can be effected more cheaply than is the case with conventional flexible wiring substrates. Therefore, and the substrate is useful when employed instead of wires for wiring. Also, since circuit patterns are formed by conductive layers in which electrically conductive metal is adhered to the surfaces of synthetic fibres, there is the advantage that the substrate possesses excellent flexibility such as not seen in the past, and, in addition, it is excellent in respect of mechanical strength. It is also suitable for parts which are subjected to very frequent bending in use, such as the connections to mechanical parts of a tape recorder or video tape recorder. There is also the advantage that the flexible wiring substrate can be made lightweight, since formation with a specific gravity on a par with that of synthetic fibres can be effected. There is therefore the advantage that it is possible to design for reduction of the weight of a device in which the flexible wiring substrate is used.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view showing one example of implementation of the flexible wiring substrate of the invention, Fig. 2 is a plane view showing an example of the main parts of the example of Fig. 1, and Fig. 3, Fig. 4 and Fig. 5 are diagrams illustrating stages of the fabrication of the example of Fig. 1

1 and 2 are electrically conductive patterns, 3 indicates electrically conductive warp yarn, 4 indicates electrically conductive weft yarn, 6, 7 and 8 are insulation layers, 9 indicates insulating warp yarn, 10 indicates insulating weft yarn, and 11 is an insulating film.

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⑤4発明の名称　フレキシブル配線基板

⑳特　願　昭59－169863

㉒出　願　昭59(1984)8月14日

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明　細　書

発明の名称　フレキシブル配線基板

特許請求の範囲

導電性金属を被着した合成繊維と絶縁層よりなる基材にエッチングにより回路パターンを形成したことを特徴とするフレキシブル配線基板。

発明の詳細な説明

〔産業上の利用分野〕

本発明は、電子回路の配線及び電子部品の搭載に用いるフレキシブル配線基板に関するものである。

〔従来の技術〕

従来、電子部品の配線及び電子部品の搭載に用いるフレキシブル配線基板は、基材全体が耐熱性のあるポリイミド、ポリエステルにて形成され、その上に銅の配線パターンが形成されたものであつた。

〔発明が解決しようとする問題点〕

しかし、基材としてのポリイミド、ポリエステルは高価で材料費が嵩み、フレキシブル配線基板の製造費が高くなる問題があつた。

また、基材全体に用いられたポリイミド、ポリエステルはフレキシブル配線基板を屈曲させたとき復元させるための応力が働くため屈曲させにくい欠点があつた。

本発明は、かかる点に鑑み良好に屈曲性が得られ安価に製造できるフレキシブル配線基板を提供することを目的とする。

〔問題点を解決するための手段〕

本発明はフレキシブル配線基板の基材を導電性金属を被着した合成繊維と絶縁層とにより形成し、エッチング後に導電性金属の残存した部分にて回路パターンを形成したものである。

〔作用〕

本発明では、導電性金属を被着した合成繊維と絶縁層よりなる基材は安価かつ屈曲性も良好であるので、エッチングにより導電性金属を除去しない部分の導電性金属にて導電パターンを形成すればフレキシブル配線基板が安価に得られその屈曲性も良好なものとできる。

〔実施例〕

第1図～第5図を参照して本発明フレキシブル印刷配線基板の一実施例について説明する。

第1図において、(1)及び(2)は導電パターンを示し、これらの導電パターン(1)及び(2)はそれぞれ導電性縦糸(3)の束及び導電性横糸(4)の束によつて形成する。これら導電性縦糸(3)及び導電性横糸(4)はポリエステル等の合成繊維により形成した糸の表面に銅あるいはニッケル等の導電性金属を被着し、表面金属層(3a)及び(4a)を形成して導電性をもたせたものである。ここで、(5)は絶縁性接着剤層である。

また(6)，(7)及び(8)は絶縁層を示し、これらの絶縁層(6)，(7)及び(8)は例えばポリエステル等の合成繊維からなる絶縁性の縦糸(9)及び横糸(10)、絶縁性接着剤層(5)よりなる。

また、(11)はウレタンシートにより形成された絶縁層を示す。

このように構成されたフレキシブル配線基板にあつては導電パターンを従来のフレキシブル配線基板の銅箔パターン同様に配しているので、ランド部(12)等も形成し(第2図)、電子部品の配線及び電子部品の搭載に用いることができる。

次に、この例の製造工程につき第3図～第5図を参照して説明する。

まず、導電性の縦糸(12)及び導電性の横糸(13)を配した導電層の一面にウレタンシート等の絶縁層(11)を設けた基板bを用意する(第3図)。導電性の縦糸(12)及び導電性の横糸(13)は合成繊維のポリエステルの糸の表面に導電性金属例えば銅あるいはニッケルを被着して表面金属層(12a)，(13a)を形成したものとする。次に、第4図に示すように導電パターンを形成しようとする部分にエッチングレジストインクをスクリーン印刷によりコーテイングする。そして、インク(14)の塗布された部分(14a)，(14b)，(14c)以外の導電金属をエッチングにより除去し絶縁層を形成する(第5図)。このとき同時に導電層が形成され、導電パターンが形成される。次に導電パターンで形成するためのエッチングレジストを形成したインクを除去する。その後、電気的接続に必要な部分だけ残すようにソルダーレジストインクのスクリーン印刷を行ない、シンボルマークの印刷を行なう等の従来のフレキシブル配線基板同様の工程を経て本例のフレキシブル配線基板を得る。

このように構成された本例においても、従来のプリント配線基板と同様に電子回路の配線、電子部品の搭載に用いることができる。

以上述べたように本実施例によれば、導電性金属を付着した合成繊維と絶縁層よりなる基材にエッチングにより回路パターンとなる導電パターンを形成するようにしたので、従来のフレキシブル配線基板に比し安価に製造でき、線材の代用として使用する際有用である。また、合成繊維の表面に導電性金属を被着した導電層で導電パターン(1)(2)を形成しているので従来になく屈曲性に富み、その上機械的強度にも富むので、ビデオテープレコーダ、テープレコーダの機械的装置の端子との接続のような屈曲使用頻度の激しい部分にも適する。また、この例は繊維並みの比重で形成できて軽量であるためフレキシブル配線基板を用いた装置の軽量化が図れる。

なお、本発明は上述実施例に限らず本発明の要旨を逸脱することなくその他種々の構成が取り得ることは勿論である。

〔発明の効果〕

本発明によれば、導電性金属を付着した合成繊維と絶縁層よりなる基材にエッチングにより回路パターンを形成したので、従来のフレキシブル配線基板に比し安価に製造できる利益がある。そのため、配線用の線材の代用として使用する際有用である。また、合成繊維の表面に導電性金属を被着した導電層で回路パターンを形成しているので従来になく屈曲性に富み、その上機械的強度にも富む利益がある。それゆえ、ビデオテープレコーダ、テープレコーダの機械的部分との接続のような屈曲使用頻度の激しい部分にも適する。また、合成繊維並みの比重で形成できフレキシブル配線基板を軽量にできる利益がある。そのため、フレキシブル配線基板を用いた装置の軽量化が図れる利

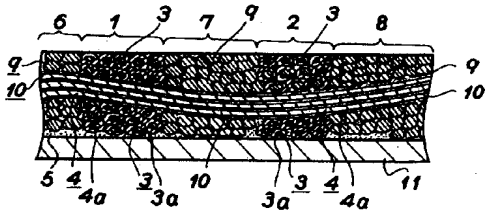
益がある。

図面の簡単な説明

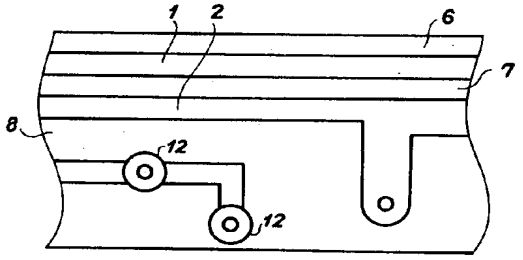
第1図は本発明フレキシブル配線基板の一実施例を示す断面図、第2図は第1図例の要部の例を示す平面図、第3図，第4図，第5図は第1図例の製造工程の例を示す線図である。

(1)及び(2)は導電パターン、(3)は導電性縦糸、(4)は導電性横糸、(6)，(7)，(8)は絶縁層、(9)は絶縁性縦糸、(10)は絶縁性横糸、(11)は絶縁膜である。

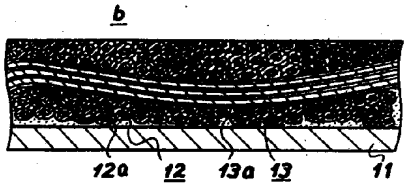
第1図



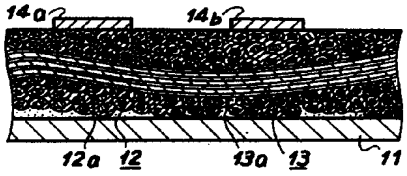
第2図



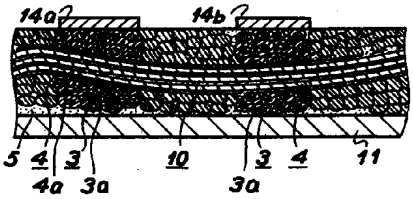
第3図



第4図



第5図



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